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QUANTITATIVE RELATIONSHIP BETWEEN THE ANATOMICAL AND FUNCTIONAL SEVERITY OF CORONARY Atherosclerotic Plaques AND Transmural MYOCARDIAL BLOOD FLOW GRADIENT: A H215O PET STUDY

Poster Contributions
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Authors: Ibrahim Danad, Pieter G. Raijmakers, Hendrik J. Harms, Niels van Royen, Adriaan A. Lammertsma, Mark Lubberink, Albert C. van Rossum, Paul Knaapen, VU University Medical Center, Amsterdam, The Netherlands

Background: Nuclear myocardial perfusion imaging (MPI) has become the mainstay for the non-invasive diagnosis of CAD. Clinical decision making is usually based on visual estimates of relative transmural myocardial perfusion. However, nuclear MPI provides no information on transmural myocardial perfusion distribution. Therefore, the present study aimed to determine the quantitative relationship between lesion severity either graded by diameter stenosis or fractional flow reserve (FFR) and transmural myocardial blood flow (MBF) gradient (Endo/Epi) using H215O positron emission tomography (PET) imaging in patients evaluated for CAD.

Methods: Sixty-six patients without a history of CAD were prospectively enrolled and underwent quantitative H215O PET imaging for quantification of transmural MBF gradients and within one week invasive coronary angiography (ICA) in conjunction with FFR measurements of all coronary arteries irrespective of the PET imaging results.

Results: There was a significant correlation between quantitative angiographic CAD severity on ICA and quantitative estimates of baseline MBF (r=-0.15, p=0.04), hyperemic MBF (r=-0.57, p<0.001), and coronary flow reserve ([CFR], r=-0.49, p<0.001). Hyperemic MBF and CFR were significantly influenced by functional stenosis severity (FFR≤0.80, p<0.001), while baseline MBF was unaffected (p=0.09). Subendocardial and subepicardial MBF at baseline was 1.04 ± 0.26 and 0.87 ± 0.22 mL·min⁻¹·g⁻¹, respectively, yielding an Endo/Epi ratio of 1.20 ± 0.14. During hyperemia, subendocardial and subepicardial MBF was 2.64 ± 1.26 and 2.80 ± 1.22 mL·min⁻¹·g⁻¹, respectively, yielding a significantly lower hyperemic Endo/Epi ratio of 0.94 ± 0.17 (p<0.01), respectively. Baseline Endo/Epi was unaffected by either angiographic or functional stenosis severity.

Conclusions: Quantitative myocardial perfusion progressively declines during hyperemia with increasing angiographic and functional CAD severity. In addition, cardiac H215O PET imaging is able to detect transmural MBF gradients and demonstrates a significantly lower hyperemic Endo/Epi ratio in ischemic myocardium.